

NOTES ON THE DISTRIBUTION OF BRITISH LAND AND FRESH-WATER MOLLUSCA FROM THE POINT OF VIEW OF HABITAT AND CLIMATE.

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PLATES V AND VI.

THE facts dealt with here are those accumulated by the late W. Denison Roebuck for his "Census of distribution". The plan of the work and the details of the results obtained will be found in the "Journal of Conchology", vol. xvi, p. 165; it is enough here to note that the records are in all cases based upon the examination of actual specimens by the referees of the Conchological Society.

The distribution of our British snails has been dealt with pretty fully as a historico-geographical problem involving their past history, their routes of migration, and so forth. My present purpose is to consider it as a problem for the working field-naturalist of to-day and to make various surmises and suggestions about its relations to existing habitats and climatic conditions. The two points of view are in no way antagonistic, the one is the complement of the other. With further knowledge it will be possible some day to weave them together into a coherent whole, but just now I can do no more than to give some illustrations which indicate that the matter is worth more detailed and intensive examination.

(1) Some species (e.g. *Hyalinia alliaria*, *Arion ater*, *Pyramidula rotundata*, *Cochlicopa lubrica*, *Limnæa peregra*) are found commonly throughout, showing that they can tolerate the climate everywhere and that habitats suitable for them are to be found throughout the islands.

(2) Some species (*Limax cinereoniger*, *L. tenellus*) occur from the north of Scotland to the south of England, but are not common; they have no geographical distribution, except that *L. tenellus* is not found in Ireland, and their occurrence seems to be determined by the existence of suitable habitats in the shape of ancient woodlands. Similarly *Succinea oblonga* and *Vertigo minutissima* are rare species with a range from the south of England to the middle of Scotland, whose occurrence probably depends on some as yet undefined quality of their habitats.

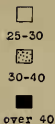
(3) *Hygromia fusca*, *Acanthinula lamellata*, *Pupa anglica*, and *Margaritana margaritifera* are definitely northern and western, being either absent or rare in the south-east. It seems fairly certain that *margaritifera* can live only in waters containing little lime and the rivers of the south-east are all calcareous.

(4) In contrast with these we have a larger number of species which are south-eastern in distribution, (a) such as *Theba cantiana*, *Helicigona lapicida*, *Azeca tridens*, *Pupa secale*, *Clausilia rolphii*,

Bithinia leachii, etc., which extend through the greater part of England, or (b) like *Helix pomatia*, *Theba cartusiana*, *Helicodonta obvoluta*, *Ena montana*, *Clausilia buplicata*, which have a much more restricted range.

The contrast between the north-western and south-eastern groups appears quite definite. It has presumably in part arisen, like the similar distribution of human culture, from the geographical position of England in relation to the Continent, but it is at least possible that the prevailing meteorological conditions have something to do with it in both instances. Maps are shown (Pl. V) giving the data as regards temperature and rainfall in a summary fashion. It would be a long matter to discuss the best form in which these factors should be considered. Rainfall is no doubt more important *qua* snails at one time of year than another, whether it falls in a few large or many small doses is no doubt germane, the proportion of rainy days and their seasonal distribution require notice. The humidity of the air would be of the greatest interest if there were any data available worth consideration. Similarly the seasonal and diurnal temperatures and their ranges will ultimately require analysis, the night temperature being perhaps more interesting to nocturnal animals like slugs than to ourselves: the "accumulated temperatures" above some fixed point divided by Strachey for agricultural purposes suggest an interesting line of inquiry. Local differences within the same area may be considerable, the relation of rainfall to altitude being the most conspicuous. Viewed, however, in a broad way, no one can doubt that the crude maps of total rainfall and mean temperatures for January and July (Pl. V) show plainly that the south-east has a very different climate to the north-west: in brief summary, the south-east is as cold or colder in winter, hotter in summer, drier and more sunny.

It is instructive to compare with the snail distributions two maps showing the proportion of the acreage of what the Board of Agriculture calls "cereal crops" (wheat, barley, oats, rye, beans, peas) occupied in each county by wheat and oats respectively (Pl. V). In the former the country is shown in four areas, in which wheat occupies 15 per cent and under (plain) of the cereal land, 16 to 25 per cent (sparsely dotted), 26 to 35 per cent (thickly dotted), and more than 35 per cent (black): in the latter the groups are under 25 per cent (plain), 25 to 49 per cent (sparsely dotted), 50 to 74 per cent (thickly dotted), and 75 per cent and over (black). Here again the exact form of comparison is open to considerable discussion and elaboration; the main conclusions, however, come out much the same whatever method is adopted. In a general way the distribution of wheat and oats may be taken to be determined by climate; a farmer will always grow wheat in preference to oats if he can, and the influence of soil has been largely obliterated by modern methods of cultivation and manuring: wheat is concentrated and valuable, so



RAINFALL



TEMPERATURE JANUARY



TEMPERATURE JULY



THE CANAL BASIN



OATS



WHEAT



TURNIPS PER ACRE

MAPS SHOWING DISTRIBUTION OF TEMPERATURE, RAINFALL,
AND SOME CROPS IN THE BRITISH ISLANDS.



DISTRIBUTION OF SOME BRITISH NON-MARINE MOLLUSCA.